Project Title: The Potential for Nitrate Contamination of Ground Water at Swine CAFO Waste Land Application Sites Following Comprehensive Nutrient Management Plans

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Long-Term Goal/APM: TBD

Abstract: Land application of CAFO waste is required to follow a Comprehensive Nutrient Management Plan (CNMP). CNMPs are developed to adhere to state specific National Resources Conservation Service (NRCS) guidelines which are typically written to be protective of surface water resources. A review of several state CNMP guidelines shows that they provide only limited direction on land application site characterization and design which are protective of ground water contamination, mainly in regions with shallow water tables. EPA's previous research has demonstrated nitrate contamination of ground water at a swine CAFO land application site where a CNMP was in place, but the operations records indicated that the land application practices deviated significantly from the CNMP design. It is unknown whether the CNMP, if followed correctly, would have been sufficiently protective of ground water. It is therefore proposed to investigate the potential for nitrate contamination of ground water under CAFO land application sites where operations are in strict compliance with a well designed CNMP. The study will be designed to evaluate the fate and transport of nitrate in the soil and groundwater at swine CAFO land application sites. The study will involve three phases: site characterization, monitoring and modeling. Three separate swine CAFO land application sites will be selected which cover a variety of climatic conditions, soil types, and ground water settings. Each site will have a well designed and managed CNMP. The first phase will address the site characterization of the land application area. In the second phase, the land application site will be continuously monitored. In the third phase, the fate and transport of nitrate through the land application area will be modeled for each site. An unsaturated zone model such as HYDRUS or other suitable model will be used to simulate the transport of nitrate through the root zone and vadose zone to predict nitrate levels at the ground water interface. The results of the unsaturated transport model will be used as input to a saturated ground water model like Visual MODFLOW model to predict the impact to ground water. The research will provide a thorough evaluation of the ability of a well designed and executed CNMP to be inherently protective of ground water. If a CNMP is not found to be adequate, the study will elucidate weaknesses in the land application design and operations process with respect to nitrate transport. This information should lead to an improvement of CNMPs to ensure that they are protective of ground water under CAFO waste land application sites.

Status: This is a new research project which is being proposed based on observations with previous field sites and on discussions within the newly-formed Land Application Water Quality Task Team (LAWQTT), consisting of EPA ORD, EPA Region 6, USDA NRCS, and USDA ARS personnel. Efforts are underway to make the appropriate ARS contacts to identify research collaboration partners and potential field sites for study.

Products: (1) EPA report on land application of swine CAFO waste relative to CNMPs and potential for ground water impact by *(planned)*; (2) issue paper on CNMP implementation and limitations regarding ground water protection *(planned)*